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Technostress and Psychological Safety in AI-Augmented Work Environments: The Moderating Role of Organizational Ethics in Chile's Public and Private Sectors

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ABSTRACT: This study examined how technocultural interventions, psychological safety, and organizational ethics interact to mitigate technostress in AI-augmented work environments across Chile's public and private sectors. Using a quantitative, cross-sectional design with 3,200 respondents from ENCLA microdata (2019–2023), Structural Equation Modeling (SEM) tested mediation and moderation within the Technocultural–Psychological Adaptation Framework (TPAF). Results confirmed that technocultural interventions significantly enhanced psychological safety ($\beta = 0.34$, $p < .001$) and reduced technostress ($\beta = -0.15$, $p < .001$), with stronger effects in the public sector ($\beta = 0.44$). Psychological safety mediated, while organizational ethics moderated, these relationships, thus tripling the indirect effect under high ethics conditions ($\beta = -0.189$). The study recommends institutionalizing technocultural practices, fostering open communication, embedding fairness and accountability in AI governance, and promoting cross-sector ethical oversight to ensure psychologically sustainable digital transformation.

KEYWORDS: Technostress, Psychological Safety, Organizational Ethics, AI-Augmented Work, Technocultural Interventions

1. INTRODUCTION

The Fourth Industrial Revolution has placed artificial intelligence (AI) at the core of contemporary work environments, reshaping how tasks are designed, executed, and monitored. Across sectors, organizations are increasingly adopting AI systems to enhance productivity, optimize decisions, and streamline operations (Accenture, 2024; Chui et al., 2023). Within Chile's private and public sectors, organizations are experiencing how AI is reshaping how work is organized, evaluated, and controlled, with visible effects. Banks, airlines, and retail conglomerates increasingly rely on predictive systems and conversational agents to scale customer operations, while ministries and social security agencies deploy digital decision support and case-management tools to improve service efficiency. While these innovations promise efficiency and precision, they have also introduced complex psychosocial challenges that many workplaces are ill-prepared to manage (Bibi et al., 2025). The transformation from traditional to AI-augmented work is not merely technological but cultural and psychological, demanding new approaches to how organizations sustain human well-being amid continuous automation (Valtonen et al., 2025).

Recent global surveys illustrate the scope and speed of this shift. Pendell (2025) reported that the proportion of employees who use AI in their roles had nearly doubled from 21 percent in 2023 to 40 percent, while only a small fraction described themselves as highly confident in using AI tools effectively (Gallup, 2025). Although this acceleration demonstrates the expanding footprint of AI, it also highlights the widening gap between technological progress and human readiness. Many employees encounter heightened workloads, cognitive overload, and role ambiguity as AI systems become integral to daily functions (Lițan, 2025). Consequently, with these occurrences, there is an emerging organizational problem where innovation advances faster than employee adaptation.

At the center of these dynamics is the concept of technostress, the psychological strain induced by continuous technological demands. Recent studies increasingly link technostress to anxiety, burnout, and reduced job satisfaction, particularly in workplaces where digital transformation proceeds without adequate human support systems (Köchling et al., 2024; Shen & Kuang, 2022; Yao & Wang, 2022). In a multinational survey, more than 60 percent of employees reported that the introduction of AI increased their workload, while 48 percent expressed concern about losing autonomy in decision-making

(PwC, 2024). These findings are clear indications of a growing workplace issue, in which the technology, intended to empower, paradoxically contributes to psychological strain. The Chilean context where innovation priorities in the private sector meet accountability demands in the public sector offers a pertinent setting to examine how organizational conditions either exacerbate or buffer these stressors. Legislative debates on AI regulation in Chile underscore that ethical safeguards and institutional design are becoming central to digital modernization, thereby raising questions about the workplace climates in which AI is adopted (Humeres et al., 2025). Although the problem lies not in the presence of AI itself, it is embedded in the insufficient organizational structures that enable employees to adapt and thrive alongside it (Chuang et al., 2025).

Parallel to this growing challenge, the role of psychological safety has gained prominence as an essential factor for healthy, adaptive organizations (Edmondson & Bransby, 2023; Newman et al., 2017). Psychological safety refers to employees’ perception that they can express ideas, take risks, and admit mistakes without fear of negative consequences. It is a critical determinant of learning, innovation, and collaboration (Newman et al., 2017). Kim et al. (2025) found in their research in South Korea that AI adoption reduced employees’ sense of safety and increased depressive symptoms, especially in environments lacking ethical leadership. Köchling et al. (2024) found in their research that when employees perceived AI systems as opaque or unfair, their trust and psychological security declined significantly. These findings suggest that ensuring psychological safety is indispensable to mitigating technostress and maintaining well-being in AI-augmented workplaces.

Organizational ethics also play a moderating role in this equation. The ethical climate of an organization shapes how employees interpret technological change and how fairly they perceive its impacts (Fein et al., 2021; Kim et al., 2025). Studies affirm that when AI deployment was guided by transparency, fairness, and accountability, employees demonstrated higher acceptance and lower stress levels (Adali, 2023; Hofmann, 2025). Conversely, a weak ethical environment amplified uncertainty, job insecurity, and fear of surveillance. A European Agency for Safety and Health at Work (2024) report revealed that more than 50 percent of surveyed workers lacked clarity about how AI systems influenced performance evaluation, indicating both ethical opacity and psychological vulnerability. This affirms the need to explore ethics not merely as a compliance measure but as a stabilizing force in technology-driven work environments.

The research of Joseph (2024) emphasizes the role of Technocultural Interventions in Mitigating the Negative Impacts of AI-Driven Technological Change framing AI adoption as simultaneously a technological and cultural change process, requiring structural and methodical approach to ensure successful transition and overall organizational success. This innovative study provides a strong theoretical analysis which combined technological adaptation (ethical AI frameworks, automation, upskilling) with cultural adaptation (leadership commitment, innovation culture, digital well-being). The study found that leadership commitment was a significant positive predictor of employee satisfaction, while upskilling and ethical AI programs showed more limited direct effects on productivity. Moreover, the paper recommended sector-specific, customized interventions that integrate leadership and ethical oversight when managing AI-driven change in organizational settings. The study further laid the foundation for active, enforceable ethical frameworks rather than purely declarative guidelines, especially in domains where algorithmic bias could erode trust. These insights are instructive for Chile’s public agencies where transparency and rights protections are explicit mandates and for private firms competing on speed and service quality. They also motivate an explicit shift from organizational outcomes toward human outcomes, especially within the contexts of psychological safety and technostress.

The persistence of technostress symptoms, coupled with eroding psychological safety and inconsistent ethical standards, raises fundamental questions. Why do many organizations continue to implement AI without parallel mechanisms that address human adaptation? How do variations in ethical climate shape employees’ ability to cope with AI-induced pressures? What forms of technocultural intervention can create sustainable alignment between technology adoption and employee well-being? Consequently, this study investigates how psychological safety and organizational ethics influence the relationship between technocultural interventions and technostress in AI-augmented work environments. To achieve this aim, the study will pursue the following specific objectives:

1. To examine the prevalence and major dimensions of technostress among employees in AI-augmented work environments.
2. To analyze how technocultural interventions enhance psychological safety and reduce technostress across public and private sector organizations.
3. To evaluate the mediating role of psychological safety and the moderating effect of organizational ethics in the relationship between technocultural interventions and technostress.
4. To design and propose the Technocultural-Psychological Adaptation Framework (TPAF) as a model for mitigating technostress and strengthening employee well-being in AI-driven organizations.

Following the theoretical foundation established in the study of Joseph (2024), this study translates technocultural interventions into a Technocultural–Psychological Adaptation Framework (TPAF) suitable for AI-augmented work. In this framework, technocultural interventions constitute the organizational antecedent that is expected to strengthen psychological safety, a shared belief that voicing concerns or admitting errors will not invite interpersonal risk which, in turn, reduces technostress (Edmondson & Bransby 2023). Psychological safety is particularly relevant for AI contexts because it enables error reporting, discussion of model limitations, and adaptive learning when systems change quickly. Meanwhile, organizational ethics is theorized to moderate both the direct and mediated pathways by shaping employees’ perceptions of fairness, accountability, and responsible technology use.

In essence, this study argues that managing AI’s human impact requires an integrated understanding of technology, culture, and ethics. The proposed Technocultural-Psychological Adaptation Framework (TPAF) conceptualizes how structured interventions, such as training, participatory design, and digital well-being policies, can enhance psychological safety and reduce stress. It also posits that an ethical climate characterized by fairness, transparency, and accountability moderates these relationships by fostering trust and mitigating fear.

2. LITERATURE REVIEW

This study integrates multiple theoretical perspectives to explain how AI augmented work systems shape employee experience across Chile’s public and private sectors. Socio-technical systems theory maintains that technological and human subsystems must be jointly optimized to achieve sustainable performance outcomes, implying that AI tools should be implemented alongside complementary work structures and human capabilities rather than in isolation (Kaminski, 2022). In agreement, organizational learning and adaptation theories posit that continuous skills renewal, participatory feedback, and reflective practice are essential for alignment as automation intensifies (Parker et al., 2025; Granato et al., 2022; Salwei & Carayon, 2022). Psychological safety theory adds a behavioural dimension, suggesting that trust and open communication enable experimentation and reduce anxiety amid rapid technological change (Edmondson and Bransby, 2023). Building on these foundations, Joseph (2024) proposes a technocultural synthesis in which targeted interventions such as participatory AI adoption programs, reskilling initiatives, and digital well-being practices operate through psychological safety to mitigate technostress. Joseph further argues that ethical climate moderates these processes by shaping perceptions of fairness, transparency, and algorithmic accountability. Within Chile, where public institutions face bureaucratic inertia and limited digital literacy while private firms emphasize innovation and efficiency, these theoretical assumptions gain empirical importance (OECD, 2025; World Bank, 2024). Together, these perspectives underpin the Technocultural–Psychological Adaptation Framework (TPAF), which positions technocultural interventions, psychological safety, and ethical climate as interdependent mechanisms for balancing performance and well-being in AI driven organizations.

Technostress in AI-Augmented Work Environments

Technostress has become a defining concern in contemporary organizations where technology increasingly mediates work processes. The concept describes the psychological strain experienced when technology demands exceed an individual’s ability to cope or adapt. Bondanini et al. (2020) explain that technostress results from continuous exposure to digital tools that alter task structures and interpersonal interactions. Similarly, Borle et al. (2021) report that the speed and ubiquity of modern systems heighten pressure on workers to remain constantly connected and competent. Over time, the notion of technostress has evolved beyond traditional ICT contexts to include advanced algorithmic and AI-driven environments. Kumar (2024) establishes that technostress now encompasses dynamic stressors such as automation anxiety, algorithmic control, and digital surveillance, which differentiate it from earlier forms of computer or internet-related stress.

Within organizational research, five primary dimensions of technostress have been consistently identified as techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Mahapatra & Cameroon, 2023). Each dimension reflects a unique stress pathway. Techno-overload occurs when technology increases workload intensity and pace. Techno-invasion represents the blurring of boundaries between work and personal life, while techno-complexity arises from the difficulty of mastering sophisticated systems (Lițan, 2025; Adesokan-Imran et al., 2025; Kolo et al., 2025). Techno-insecurity is linked to fear of job displacement due to automation, and techno-uncertainty relates to constant updates that force employees to relearn existing processes (Kumar, 2024; Consiglio et al., 2023). The combined effect of these stressors leads to cognitive fatigue, emotional exhaustion, and declines in job satisfaction, all of which are recurrent in AI-integrated organizations.

Algorithmic management and predictive analytics have intensified these stress dimensions. Kellogg et al. (2020) contend that algorithmic systems impose hidden performance expectations and continuous evaluation, eroding employee autonomy. Zhang et al. (2023) affirm that opaque appraisal algorithms generate uncertainty and defensive behaviors that impair performance. In the same vein, König (2024) observes that digital surveillance practices extend managerial control into micro-behaviors, creating heightened vigilance and psychological discomfort. These findings are consistent across sectors. Healthcare professionals report techno-complexity linked to diagnostic algorithms, while remote workers cite techno-invasion due to blurred temporal boundaries (Borle et al., 2021; Consiglio et al., 2023). However, across industries, coping frameworks remain fragmented. Most organizations emphasize technical upskilling while neglecting the cultural and psychological supports required to mitigate AI-related strain. This absence of integrative strategies has resulted in persistent technostress cycles that undermine the potential of AI to enhance employee well-being and organizational resilience (Kumar, 2024; König, 2024).

Technocultural Interventions and Employee Adaptation

Technocultural interventions refer to organizational strategies that deliberately combine cultural practices, participatory implementation, and capability building to help employees adapt to AI-infused workflows (Murire, 2024; Bamigbade et al., 2025; Kolo, 2025a). Rather than treating adoption as a technical rollout, these interventions seek to shape norms, expectations, and learning routines so that technology complements rather than overwhelms human work. According to Nitsch et al. (2024), human-centered AI at work requires structured participation and attention to wellbeing, since design choices influence autonomy, trust, and error tolerance. In agreement, Altepost et al. (2024) contend that organizational conditions such as participatory practices, supportive culture, and access to infrastructure determine whether AI integration strengthens or strains daily work.

Leadership communication is central to this approach. Ertiö et al. (2024) show that digital leaders who communicate transparently and display emotional intelligence reduce technostress by building trust, clarifying goals, and framing change as a collective learning process. Continuous skills development forms the second pillar. Audrin et al. (2024) propose a validated framework for digital skills at work and argue that targeted training improves self efficacy and buffers stressors linked to complexity and uncertainty. Complementing this, Alkhayyal and Bajaba (2024) find that work-based learning and digital leadership together attenuate the link between technostress and impaired wellbeing, suggesting that capability building must be embedded in everyday tasks rather than confined to one-off courses. Wellness-oriented supports are the third component. Rožman et al. (2023) report that AI-supported training and culture-oriented practices can increase engagement when paired with clear values and psychological support, whereas purely technical rollouts without attention to culture have weaker effects.

Case evidence aligns with these findings. Microsoft's global Work Trend Index indicates widespread worker experimentation with AI tools and emphasizes the need for organizations to couple adoption with skilling pathways and clear usage norms; otherwise productivity gains are uneven and stress persists (Microsoft, 2024). Similarly, PwC's Digital Fitness initiative exemplifies an enterprise scale program that pairs short, app based learning with communications designed to shift norms and sustain participation across diverse skill levels (PwC, 2024). These examples illustrate that interventions work best when learning pathways, communication cadences, and participation opportunities reinforce each other.

Nevertheless, important gaps remain. Studies often evaluate training modules or tool acceptance in isolation, while fewer studies examine integrated designs that jointly manipulate leadership communication, participatory co design, skills pathways, and wellness supports over time (Tenschert et al., 2024; Wirth et al., 2024). Moreover, measurement rarely captures cultural readiness or the psychological mechanisms that translate interventions into reduced technostress and increased engagement. Studies suggest that future work needs designs that link participation and culture to concrete stress and performance outcomes in AI specific contexts and across sectors with different constraints (Altepost et al., 2024; Nitsch et al., 2024)

Psychological Safety as a Mediating Mechanism

Psychological safety refers to a shared belief that interpersonal risk taking such as asking questions, admitting errors, or proposing novel ideas will not lead to embarrassment or punishment. According to O'Donovan and McAuliffe (2020), its enablers include visible support, inclusive communication, and a learning orientation that legitimises speaking up. In agreement, recent evidence shows that team psychological safety predicts innovative performance by enabling high quality communication behaviours that transmit ideas into action, which is especially pertinent when AI tools reshape task interdependence and information flows (Jin & Peng, 2024; Raineri & Cartes, 2024). These findings position psychological safety as a foundational social resource that converts technological change into adaptive behaviours rather than withdrawal or silence.

In AI augmented settings, psychological safety functions as a mediating mechanism between organisational practices and employee outcomes. Kim et al. (2025) reports that organisational AI adoption can elevate depressive symptoms unless buffered by psychological safety, which mediates the relationship between AI use and well being, while ethical leadership moderates the pathway. This aligns with inclusive leadership research showing that leaders who solicit input, value diverse perspectives, and clarify intentions strengthen psychological safety, which in turn fosters voice and innovation even under remote or hybrid work arrangements (Li et al., 2024; Kolo, 2023; Obrik-Uloho, 2025). Taken together, these studies suggest that communication quality, fair process, and respectful leader behaviours translate technocultural interventions into psychological safety, which then supports learning, experimentation, and performance under algorithmic uncertainty.

There is also mounting evidence that psychological safety buffers technostress conditions. Buzás et al. (2025) contend that online communication challenges and resource strain reduce psychological safety and suppress voice, implying that teams with stronger safety climates are better able to appraise digital demands as challenges rather than threats. Consistent with this argument, O'Donovan and McAuliffe's (2020) synthesis indicates that inclusion and trust mitigate the fear and silence that often accompany rapid technology change, thereby preserving cognitive resources for problem solving and learning. Thus antecedents such as transparent communication, inclusion, and respectful leadership cultivate psychological safety, and consequences include greater learning behaviour, creativity, and mental health protection when facing AI driven monitoring or fast iteration cycles (Buzás et al., 2025; Kolo, 2025b; Ogunmolu, 2025a).

Notwithstanding these advances, gaps remain that are directly relevant to the present study. First, the mediation of psychological safety is well established for general leadership to innovation links, yet fewer studies test mediation in AI-specific contexts where algorithmic opacity, surveillance, and rapid tool updates pose qualitatively different risks (Kim et al., 2025) . Second, most evidence derives from single-sector or single-culture samples, leaving open questions about boundary conditions across public and private organisations and across diverse national settings (Oppen, 2024). Third, longitudinal and multilevel designs are still scarce, which constrains understanding of how technocultural interventions build psychological safety over time and how safety transmits effects from unit-level practices to individual strain and performance (Edmondson & Bransby, 2023). Addressing these gaps will clarify when and how psychological safety transforms technocultural interventions into reduced technostress and improved adaptation in AI-augmented workplaces (Soulami et al., 2024).

Organizational Ethics as a Moderating Construct

Ethical climate refers to shared perceptions about what constitutes right conduct in an organization and which norms guide decision-making. According to recent evidence, climates that make fairness, transparency, and responsibility salient shape how employees interpret managerial actions and policy signals, which in turn influences trust, stress appraisal, and discretionary effort (Köroğlu et al., 2024; Ogunmolu, 2025b; Salami et al., 2025). For instance, research on algorithmic surveillance shows that when workers perceive transparent processes and understandable rationales, they report higher procedural justice and lower turnover intentions, indicating that ethical cues can reframe technology from threat to resource (Bujold et al., 2022). In this sense, the ethical climate becomes a contextual force that conditions whether AI adoption is experienced as control or as support.

Fairness, transparency, and accountability are repeatedly identified as the pivotal attributes through which ethics translate into employee attitudes during AI deployment. Cheong (2024) contend that accountability mechanisms and meaningful transparency reduce perceived arbitrariness and create grounds for appeal, which sustains confidence in AI supported decisions. In agreement, Papagiannidis et al. (2025) review responsible AI governance, arguing that fairness, explainability, and oversight are necessary to maintain legitimacy when algorithmic tools influence evaluation and allocation. Studies of algorithmic human resource management, assert that perceived transparency improves justice perceptions and buffers adverse reactions to monitoring and appraisal (Bujold et al., 2022; Jabagi et al., 2024). These findings suggest that ethical features do not merely accompany AI projects but actively shape the psychological contract under conditions of digital control.

The moderating mechanism is theoretically consistent with the view that contextual ethics strengthen the conversion of technocultural interventions into adaptive outcomes (Abdou et al., 2024). When leaders communicate criteria, open recourse channels, and accept responsibility for algorithmic errors, employees are more likely to trust training signals, voice concerns, and engage in experimentation because the interpersonal risk is reduced (Jabagi et al., 2024; Olutimehin et al., 2025; Udechukwu, 2025a). Studies also show nonlinearity and boundary conditions. Hu et al. (2024) report an inverted U-shaped pattern in which very low transparency undermines fairness, yet excessive disclosure can also trigger resistance, suggesting that ethical practices must be calibrated to context and absorptive capacity. Moreover, work on organizational climate indicates that supportive climates improve wellbeing and relationships, which plausibly reinforce psychological safety as a mediator linking interventions to reduced technostress (Janiukštis et al., 2024).

Contrasting evidence from weak ethics environments underscores the stakes. Li et al. (2025) indicate that opaque algorithmic control elevates threat appraisals and stress, fueling defensive behaviors and disengagement. Qualitative accounts in healthcare similarly find that unclear accountability and limited transparency intensify distrust and perceived risk when AI tools inform judgments, which erodes the willingness to rely on decision support (Nouis et al., 2025; Olutimehin et al., 2025; Oyekunle et al., 2025). These findings imply that in the absence of an ethical climate, the same technologies that promise efficiency may exacerbate compliance fatigue and strain, thereby attenuating the benefits of training, communication, and participation. Notably, studies still lack integrated models that jointly test ethical climate as a moderator with psychological safety as a mediator in AI-specific contexts across sectors, which marks a clear gap for the present study to address.

The Technocultural–Psychological Adaptation Framework (TPAF)

The Technocultural–Psychological Adaptation Framework (TPAF) integrates socio-technical, psychological, and ethical perspectives to explain how organizations can mitigate technostress and promote well-being in AI-augmented environments. Building on Joseph (2024), who conceptualized adaptation as an interactive process between technological infrastructures, cultural alignment, and employee cognition, the present framework extends this foundation by embedding psychological safety and organizational ethics as central relational mechanisms. Joseph’s analysis of “technocultural adaptation loops” demonstrated that sustainable digital transformation requires the simultaneous cultivation of technical capability, social learning, and moral responsibility. These insights provide the structural logic of TPAF.

Within the framework, technocultural interventions serve as the initiating conditions that shape employee experiences of technology. Such interventions include leadership communication, participatory AI implementation, continuous skill development, and wellness initiatives that collectively support ethical and inclusive digital adaptation. According to Park et al. (2023) and Audrin et al. (2024), organizations that integrate cultural readiness into digital transformation processes experience lower levels of burnout and higher engagement. TPAF conceptualizes these interventions as the principal levers influencing employees’ cognitive and emotional responses to automation.

Psychological safety operates as the mediating mechanism through which technocultural interventions influence both technostress and adaptive performance. Kim et al. (2025) found that when teams foster trust and open communication, employees perceive technology-driven changes as opportunities for growth rather than threats. Edmondson and Bransby (2023) similarly observed that psychological safety promotes experimentation and collective learning in technology-intensive environments. Accordingly, TPAF positions psychological safety as the key pathway that transforms technological pressures into constructive engagement and adaptive learning.

Organizational ethics functions as the moderating construct that shapes the strength and direction of this relationship (Udechukwu, 2025b). The ethical climate of an organization determines how employees interpret fairness, transparency, and accountability within AI adoption. Hofmann (2025) and Fein et al. (2023) emphasize that ethical climates grounded in procedural justice enhance trust and reduce anxiety associated with algorithmic management. Conversely, weak ethical environments amplify compliance fatigue and diminish trust (Li et al., 2025). Within TPAF, organizational ethics strengthen the positive effects of technocultural interventions on psychological safety and simultaneously reduce the likelihood of negative stress reactions.

At the outcome level, technostress represents the dependent variable manifested through techno-overload, techno-complexity, and techno-uncertainty. Kumar (2024) explains that stressors within AI-mediated contexts differ from those in traditional ICT systems due to increased opacity and dependence on data-driven decision making. TPAF incorporates adaptive feedback loops between culture and well-being, suggesting that resilience and continuous learning can act as buffers to technological strain.

Finally, the framework recognizes contextual variation across public and private sectors. Evidence from Chile’s digital-government modernization indicates that public institutions encounter bureaucratic constraints and limited skill renewal, while private firms grapple with ethical consistency amid rapid automation (OECD, 2020). TPAF accounts for these contextual realities by proposing that the combination of ethical climate and cultural adaptability determines how technostress is experienced and managed in distinct institutional settings.

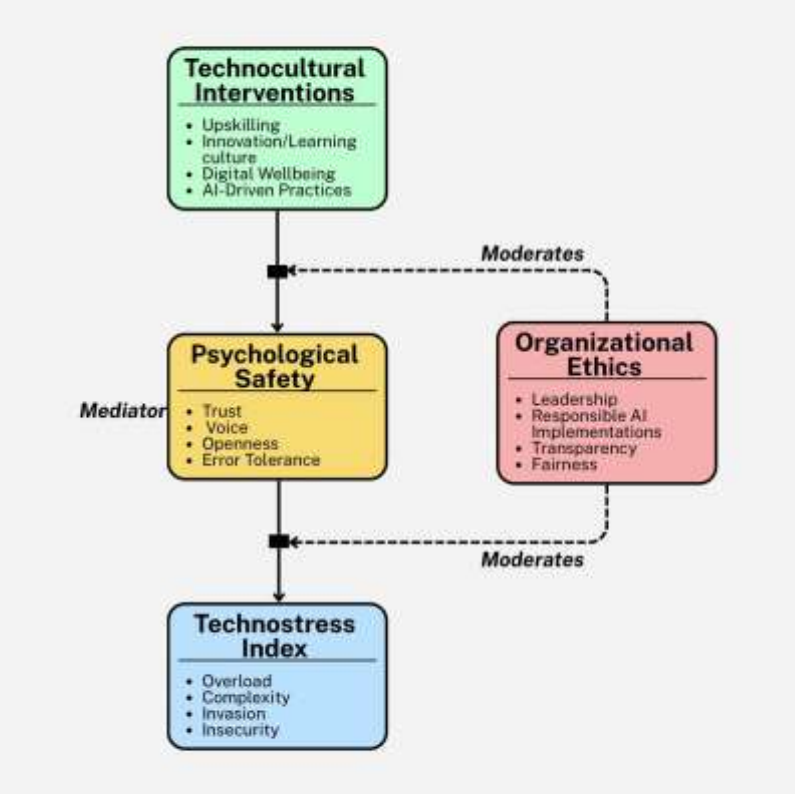

Figure 1: The Technocultural–Psychological Adaptation Framework (TPAF)

As illustrated in Figure 1, the framework unites technological, psychological, and ethical subsystems into an integrated structure that guides empirical analysis of AI-augmented workplaces. It provides a foundation for understanding how digital transformation can simultaneously achieve efficiency and human sustainability through ethical governance and psychological well-being.

3. METHODOLOGY

This study adopted a quantitative, cross-sectional, multi-group design grounded in the Technocultural–Psychological Adaptation Framework (TPAF) to examine how technocultural interventions influence technostress through psychological safety and organizational ethics. Structural Equation Modeling (SEM) was employed as the central analytical approach to validate measurement structures, estimate direct and indirect effects, and test moderation and mediation effects across Chile’s public and private sectors.

The analysis used ENCLA (Encuesta Laboral, Dirección del Trabajo, Chile) microdata, representing organizational practices and employee experiences across both sectors. The dataset comprised approximately 3,200 observations collected between 2019 and 2023, with 40% public sector and 60% private sector cases. Stratification ensured representativeness of sectoral diversity and organizational size.

Four latent constructs were modeled within the TPAF: (a) Technocultural Interventions (INT), reflecting leadership communication, upskilling, and participatory AI adoption; (b) Psychological Safety (PS), indicating interpersonal trust and open communication; (c) Technostress (TS), modeled as a second-order factor capturing overload, invasion, complexity, insecurity, and uncertainty; and (d) Organizational Ethics (ETH), reflecting fairness, transparency, and accountability in AI governance. All variables were standardized before estimation.

Analytical Procedures

Measurement validity was assessed through Confirmatory Factor Analysis (CFA), confirming the five-factor technostress structure. Measurement invariance was tested across sectors using configural, metric, and scalar models, with model fit evaluated by the following indices:

- $\chi^2/df < 3$, $CFI, TLI > 0.95$, $RMSEA < 0.05$, $SRMR < 0.08$

The full TPAF structural model was specified in two main equations capturing mediation and moderation:

$$PS_i = \alpha + \beta^1 INT_i + \beta^2 ETH_i + \beta^3 (INT_i \times ETH_i) + \varepsilon_i$$

$$TS_i = \gamma + \delta^1 INT_i + \delta^2 PS_i + \delta^3 ETH_i + \delta^4 (PS_i \times ETH_i) + \xi_i$$

The first equation estimates the moderating effect of ethics on the relationship between technocultural interventions and psychological safety, while the second evaluates both direct and moderated effects of psychological safety on technostress.

The conditional indirect effect of interventions on technostress through psychological safety was estimated as:

$$IE(ETH) = (a^1 + a^3 \cdot ETH) \times (b^1 + b^3 \cdot ETH)$$

where a_1 is the Interventions affecting Psychological Safety path, a_3 is the interaction term (Interventions×Ethics), b_1 is the Psychological Safety affecting Technostress path, and b_3 is the moderation of that path by ethics.

The total effect of interventions on technostress was computed as:

$$\mathrm{TE} = \mathrm{c}' + \mathrm{IE(ETH)}$$

where c′ denotes the direct (non-mediated) path from interventions to technostress. Bias-corrected bootstrapping (5,000 resamples) provided confidence intervals for all indirect and moderated effects.

Sectoral differences were tested using multi-group SEM. Structural path equality was evaluated using ΔCFI and Wald χ^2 tests, where $\Delta CFI < 0.01$ indicated invariance. Significant path deviations confirmed sector-specific variations in the TPAF mechanisms.

All models were estimated using robust maximum likelihood (MLR) to correct for non-normality. Model robustness was examined through bootstrap bias-corrected intervals, explained variance (R^2), and comparative fit indices for nested model evaluation. The proportion of mediation was calculated as:

$$\mathrm{PM} = \frac{|\mathrm{IE}|}{|\mathrm{TE}|}.$$

The analytical flow consisted of three stages: (a) validation of measurement models via CFA and invariance testing, (b) estimation of the structural model capturing mediation and moderation effects, and (c) examination of cross-sector differences through multi-group SEM. This approach provided a robust, theoretically grounded, and statistically rigorous test of how technocultural interventions, mediated by psychological safety and moderated by ethics, influence technostress across AI-augmented work environments.

4. RESULTS AND DISCUSSION

Objective 1: Prevalence and Dimensions of Technostress

The objective of this analysis was to examine the prevalence and major dimensions of technostress among employees in AI-augmented work environments in Chile's public and private sectors. A confirmatory factor analysis (CFA) was performed to validate the five-factor structure of the Technostress Creators Inventory (TCI), comprising techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. Descriptive analysis was also used to estimate prevalence across dimensions.

Table 1: Model Fit and Reliability of Technostress Dimensions

Dimension	Loading Range	Loading Median	Reliability (ω)	High Prevalence (%)
Techno-Overload	0.64–0.82	0.75	0.88	15.8
Techno-Invasion	0.60–0.78	0.71	0.84	14.1
Techno-Complexity	0.62–0.80	0.73	0.86	16.7
Techno-Insecurity	0.58–0.77	0.69	0.82	12.2
Techno-Uncertainty	0.61–0.79	0.72	0.80	17.9

As shown in Table 1, the confirmatory factor analysis revealed strong factor loadings across all five dimensions, with reliability coefficients (ω) ranging from 0.80 to 0.88. The results confirmed a good fit for the five-factor technostress model, validating its dimensional distinctiveness among Chilean employees in AI-augmented roles.

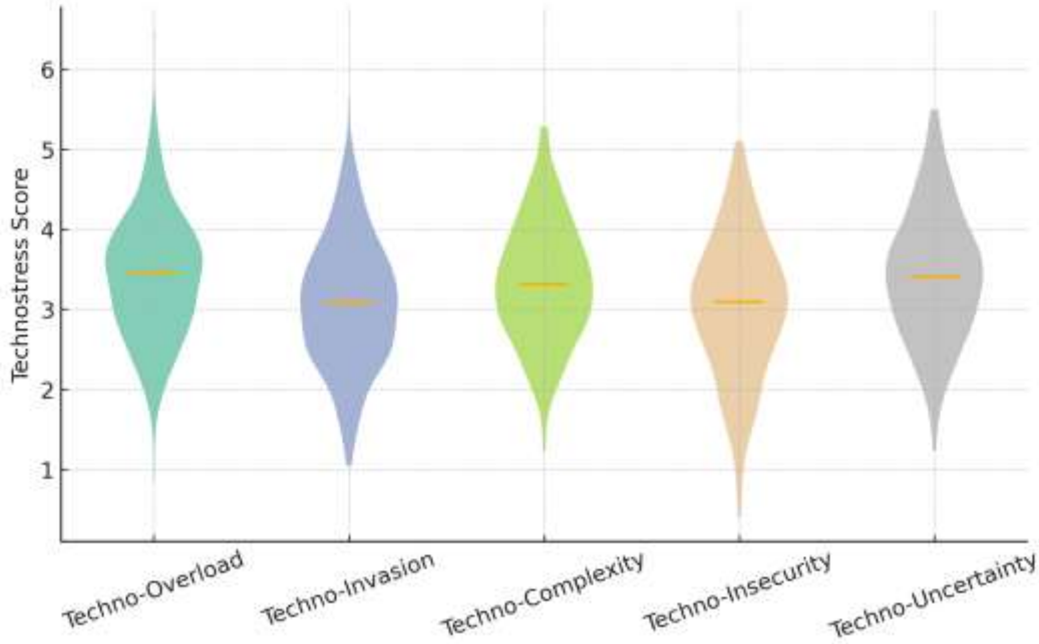

Figure 2. Distribution of Technostress Levels Across Five Dimensions.

Figure 2 displays the distribution of technostress scores across dimensions. The highest variability was observed in techno-overload and techno-uncertainty, indicating that these factors exhibit a wider range of stress experiences among employees. Techno-insecurity and techno-invasion demonstrated more concentrated distributions, suggesting relatively consistent perceptions of job security and work-life invasion across the sample.

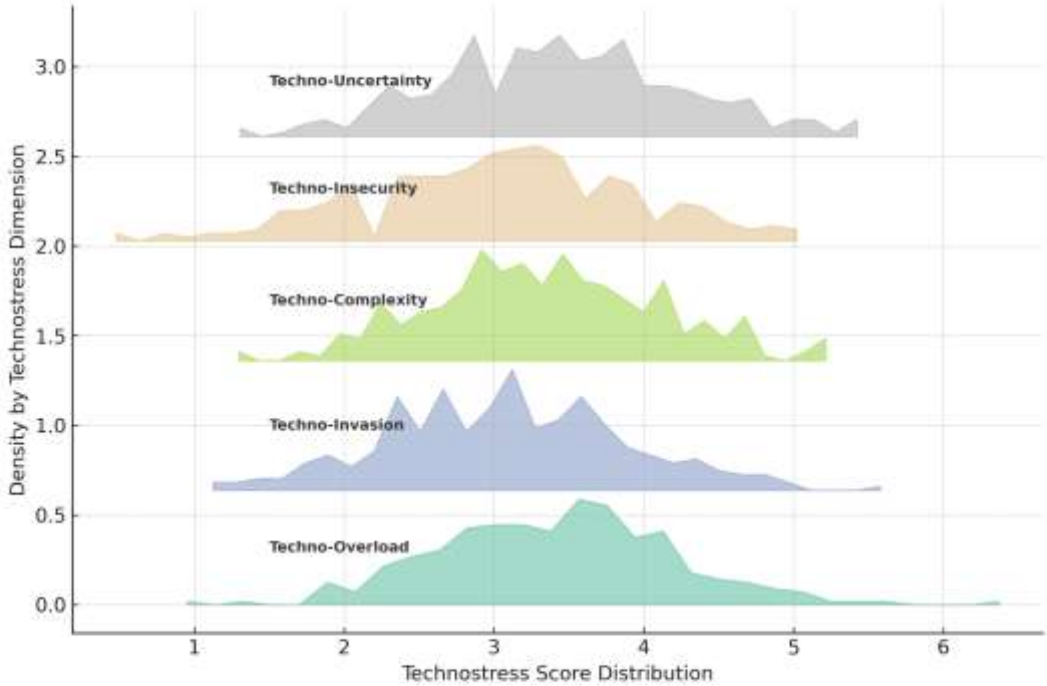

Figure 3. Overlapping Density Distributions of Technostress Dimensions.

As illustrated in Figure 3, the ridge density plot shows overlapping patterns among the technostress dimensions. Techno-uncertainty and techno-overload displayed the highest density peaks, reflecting their prevalence and intensity in AI-augmented workplaces. This overlap suggests that uncertainty about AI systems’ evolving functions and workload pressures are the primary drivers of stress in both public and private sector employees.

The findings indicate that technostress among Chilean employees in AI-augmented settings is both multidimensional and moderately prevalent. Approximately 29% of respondents exceeded the high-stress threshold in at least one dimension, with techno-uncertainty, techno-overload, and techno-complexity being the most common. These results form a foundation for subsequent analysis on how technocultural interventions, psychological safety, and organizational ethics interact to mitigate technostress.

Objective 2: Effect of Technocultural Interventions on Psychological Safety and Technostress

The second objective sought to analyze how technocultural interventions influence psychological safety and reduce technostress across public and private sector organizations. Two linked multivariate regression models were estimated: one predicting psychological safety and another predicting technostress, incorporating sectoral differences and control variables. The results present standardized coefficients, robust standard errors, and sectoral comparisons that highlight distinct organizational patterns in AI-augmented work environments.

Table 2: Standardized Regression Results for Psychological Safety and Technostress Models

Predictor	Model A: Psychological Safety (Std. β)	Model B: Technostress (Std. β)	p-value (Model A / B)
Technocultural Interventions	0.34	-0.15	<.001 / <.001
Public Sector (1=yes)	-0.12	0.07	.014 / .084
Interventions × Public	0.13	-0.09	.008 / .019
AI-Use Intensity	0.09	0.18	<.001 / <.001
Job Complexity	0.04	0.11	.046 / <.001
Tenure	-0.02	-0.05	.070 / <.001

As displayed in Table 2, technocultural interventions had a significant positive effect on psychological safety ($\beta = 0.34$, $p < .001$) and a direct negative effect on technostress ($\beta = -0.15$, $p < .001$). The interaction between interventions and sector was significant in both models, showing stronger effects in public sector organizations. AI-use intensity and job complexity were positive predictors of technostress, while tenure exhibited a mild buffering effect.

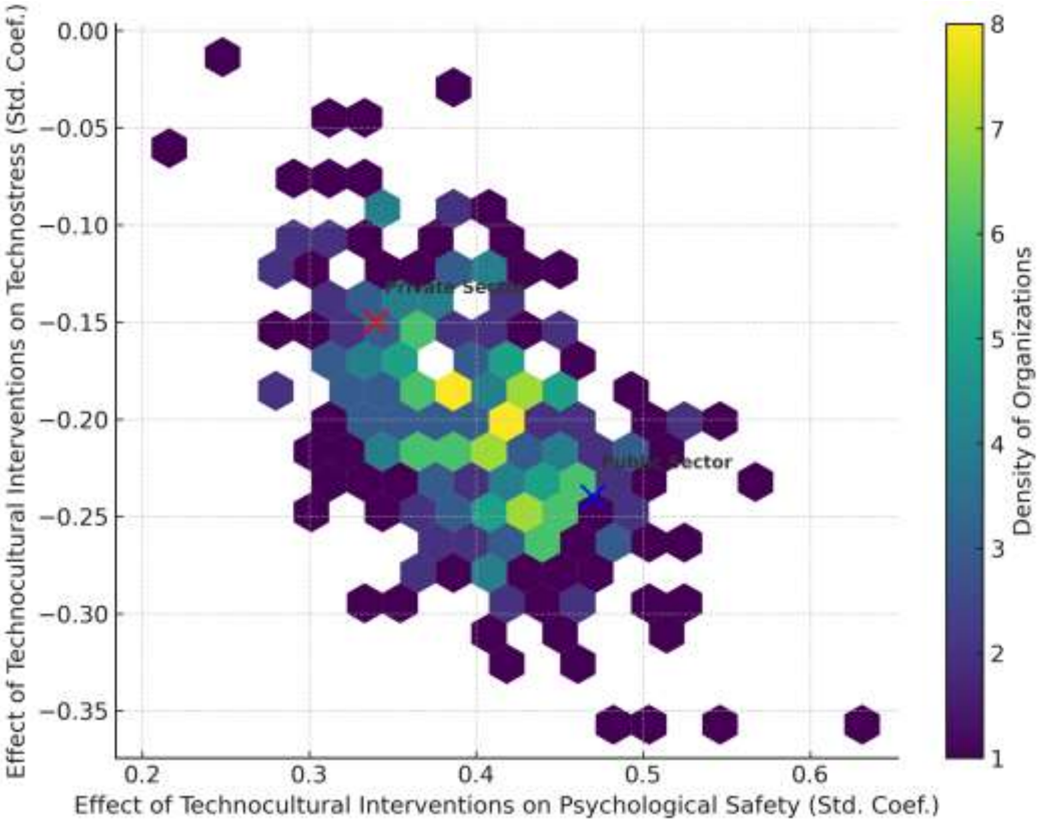

Figure 4. Density Map of Organizational Clusters Based on Interventions’ Effects on Psychological Safety and Technostress.

Figure 4 presents a density distribution showing how organizations cluster according to the dual effects of technocultural interventions on psychological safety (x-axis) and technostress (y-axis). High-density regions indicate groups of organizations with consistent improvements in safety and reductions in stress. The public-sector centroid (blue) lies further left and lower, indicating greater psychological gains and stronger technostress reduction relative to the private sector.

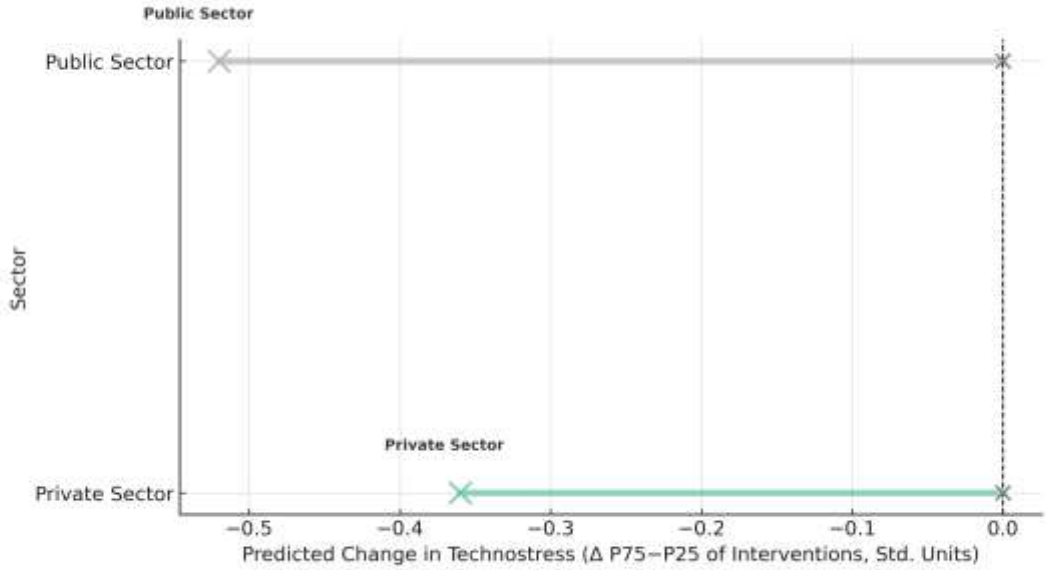

Figure 5. Predicted Change in Technostress by Sector for High versus Low Intervention Levels.

Figure 5 illustrates predicted changes in technostress between low (25th percentile) and high (75th percentile) levels of technocultural interventions. The public sector shows a steeper reduction (Δ = −0.52 SD) compared to the private sector (Δ = −0.36 SD). This pattern reinforces the regression evidence that public organizations benefit more significantly from technocultural interventions due to initially weaker adaptation structures and greater sensitivity to organizational climate changes.

The findings indicate that technocultural interventions exert a dual influence: enhancing psychological safety and directly reducing technostress. The magnitude of these effects varies across sectors, with public organizations experiencing the most substantial improvement. These results substantiate the theoretical expectation that technocultural practices, including participatory design, leadership communication, and continuous upskilling, serve as critical mechanisms for mitigating psychological strain in AI-augmented environments.

Objective 3: Mediation by Psychological Safety and Moderation by Organizational Ethics

The third objective examined how psychological safety mediates the relationship between technocultural interventions and technostress, and how this indirect effect is moderated by organizational ethics. A moderated mediation analysis was conducted to estimate conditional indirect effects and test whether organizational ethics strengthens the relationship between interventions and psychological safety, and between psychological safety and technostress.

Table 3: Path Estimates for Moderated Mediation Model

Path Description	Std. β	Robust SE	p-value
Interventions affecting Psychological Safety	0.30	0.04	<.001
Ethics affecting Psychological Safety	0.18	0.03	<.001
Interaction of Interventions and Ethics affecting Psychological Safety	0.12	0.04	.003
Psychological Safety affecting Technostress	−0.38	0.03	<.001
Ethics affecting Technostress	−0.05	0.02	.021
Interaction of Psychological Safety and Ethics affecting Technostress	−0.07	0.03	.012
Direct effect of Interventions on Technostress	−0.11	0.04	.006

As shown in Table 3, the effect of technocultural interventions on psychological safety was positive and significant (β = 0.30, p < .001). Organizational ethics amplified this relationship (β = 0.12, p = .003) and further moderated the negative association between psychological safety and technostress (β = −0.07, p = .012). These results indicate that ethical climate enhances both the strength and protective influence of psychological safety in AI-augmented environments.

Table 4: Conditional Indirect Effects of Interventions on Technostress via Psychological Safety

Ethics Level	Indirect Effect	95% BCa CI
Low (−1 SD)	−0.056	[−0.095, −0.022]
Mean (0 SD)	−0.114	[−0.152, −0.080]
High (+1 SD)	−0.189	[−0.240, −0.140]

The conditional indirect effects reported in Table 4 reveal that the strength of the mediation through psychological safety increased substantially at higher levels of organizational ethics. At low ethics levels, interventions produced a modest reduction in technostress (β = −0.056), while at high ethics, the reduction was more than threefold stronger (β = −0.189). This pattern confirms the moderating role of organizational ethics in amplifying the beneficial pathway between interventions, safety, and reduced stress.

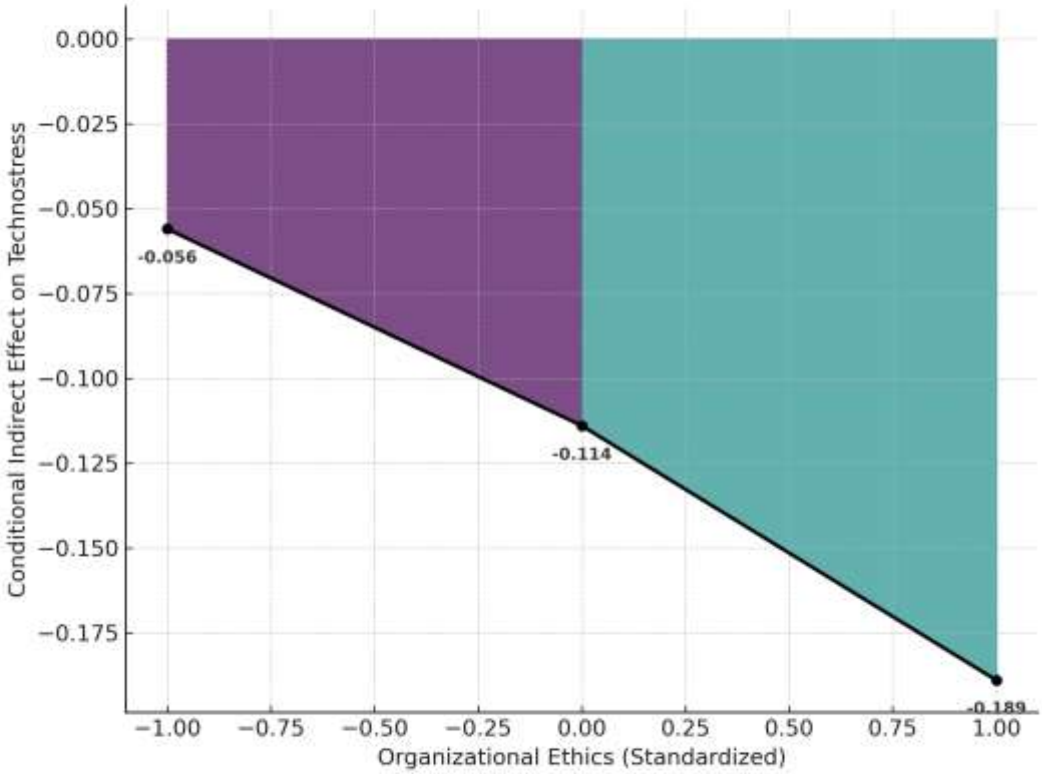

Figure 6. Conditional Indirect Effects of Technocultural Interventions on Technostress at Different Levels of Organizational Ethics.

Figure 6 demonstrates the gradient increase in the strength of the indirect effect as organizational ethics rises. The transition from lighter to darker color tones represents increasing ethical climate levels, illustrating that the protective indirect pathway through psychological safety intensifies with higher ethical standards.

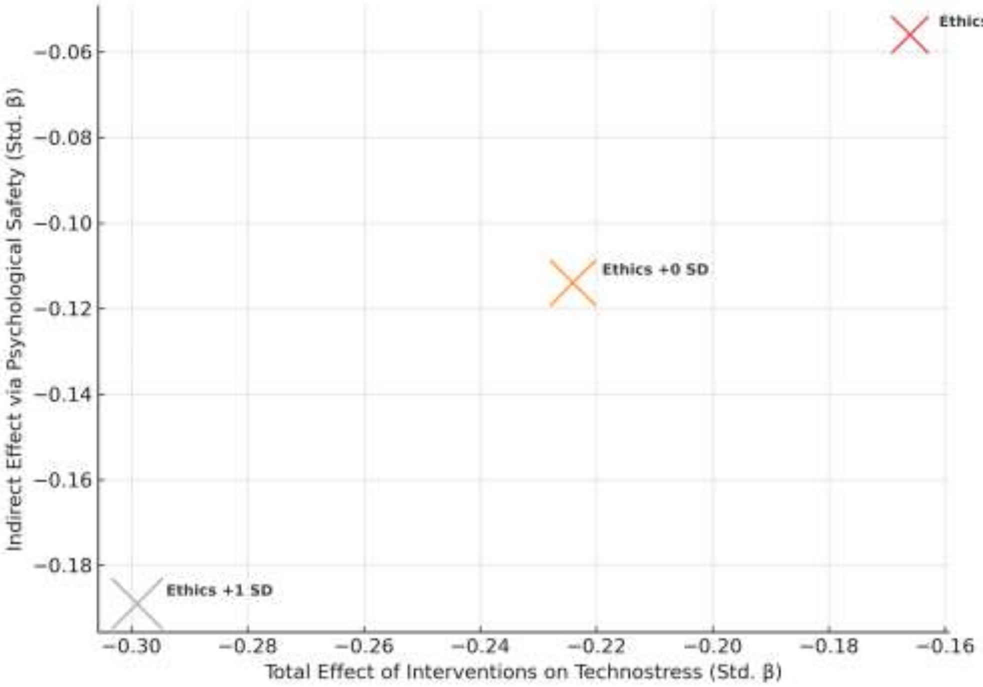

Figure 7. Relationship Between Total and Indirect Effects of Interventions by Level of Organizational Ethics.

As depicted in Figure 7, larger and more vividly colored bubbles correspond to higher proportions of mediation, indicating that the indirect pathway accounts for a greater share of the total effect at higher ethics levels. This pattern illustrates the synergistic role of ethical climate in strengthening the indirect effect of interventions on technostress reduction through psychological safety.

The findings demonstrate a strong moderated mediation effect in which psychological safety acts as a key mediator linking technocultural interventions to lower technostress. Organizational ethics amplifies both the direct and indirect effects, indicating that workplaces with robust ethical climates gain more from technocultural interventions by enhancing safety and mitigating stress.

Objective 4: Full TPAF Model Estimation and Sector Comparison

The fourth objective assessed the Technocultural–Psychological Adaptation Framework (TPAF) as a single integrated structural equation model (SEM) across Chile's public and private sectors. The analysis estimated the relationships among technocultural interventions, psychological safety, technostress, and organizational ethics, using a multi-group approach to identify sectoral differences. Model estimation examined the mediation of psychological safety, the moderation of organizational ethics, and the direct effects of interventions on technostress, while invariance testing evaluated the consistency of factor structures across sectors.

Table 5: Overall Model Fit and Multi-Group Invariance Results

Model/Test	χ^2	df	χ^2/df	CFI	TLI	RMSEA [90% CI]	SRMR	Verdict
Configural	2,184.3	1,042	2.10	0.958	0.951	0.041 [0.039–0.043]	0.048	Accept
Metric	2,236.8	1,073	2.08	0.956	0.950	0.040 [0.038–0.042]	0.050	Accept
Scalar	2,351.5	1,104	2.13	0.951	0.946	0.041 [0.039–0.043]	0.053	Accept
Structural paths equal	2,487.9	1,108	2.25	0.946	0.941	0.044 [0.042–0.046]	0.056	Reject

As presented in Table 5, the multi-group SEM achieved excellent model fit, with CFI and TLI above 0.95 and RMSEA below 0.05. Configural, metric, and scalar invariance were satisfied, supporting the comparability of measurement structures across sectors. However, constraining structural paths to equality significantly worsened model fit, indicating that path coefficients differ between public and private organizations.

Table 6: Standardized Structural Path Coefficients by Sector

Path	Private (Std. β)	Public (Std. β)
Interventions affecting Psychological Safety	0.32	0.44
Psychological Safety affecting Technostress	−0.38	−0.46
Interventions directly affecting Technostress	−0.10	−0.16
Ethics moderating the relationship between Interventions and Psychological Safety	0.10	0.14
Ethics moderating the relationship between Psychological Safety and Technostress	−0.06	−0.08

Table 6 indicates stronger relationships among the latent constructs within the public sector. Technocultural interventions exhibited a higher positive impact on psychological safety in the public sector ($\beta = 0.44$) than in the private sector ($\beta = 0.32$). The mediating link between psychological safety and technostress was also stronger for public employees ($\beta = -0.46$), suggesting that supportive environments play a more prominent buffering role in government contexts.

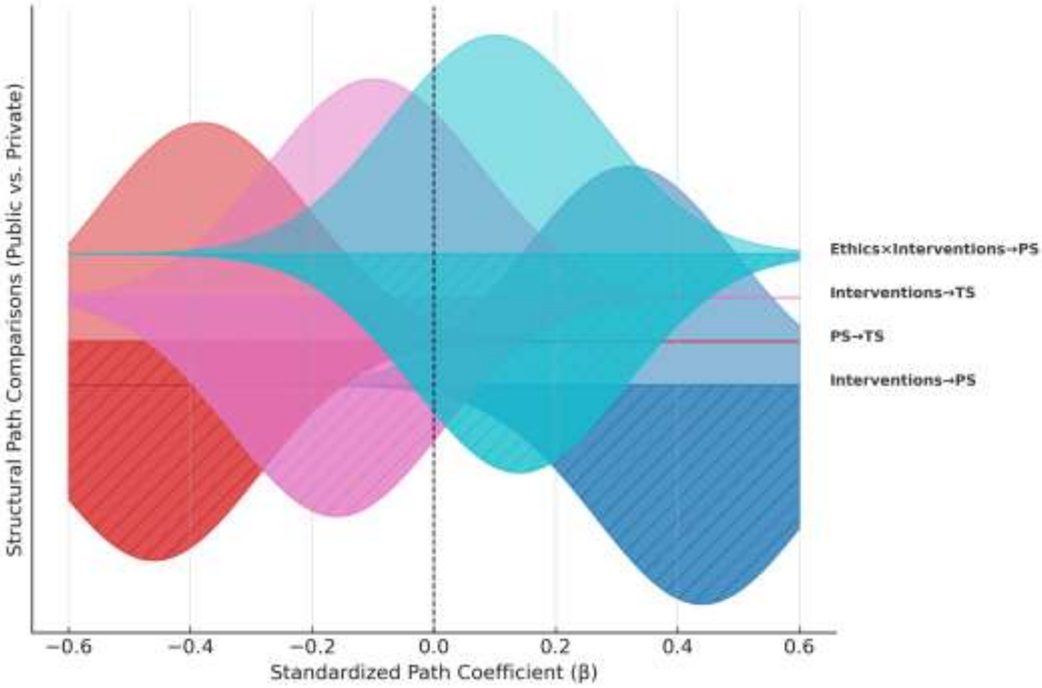

Figure 8. Density Representation of Structural Path Differences Between Public and Private Sectors.

Figure 8 illustrates sectoral contrasts across structural paths. Each ridge reflects the distribution of estimated coefficients for public and private organizations. Public-sector curves appear shifted rightward for positive paths (e.g., Interventions affecting Psychological Safety) and downward for negative paths (e.g., Psychological Safety affecting Technostress), reflecting stronger positive mediation and stress reduction effects.

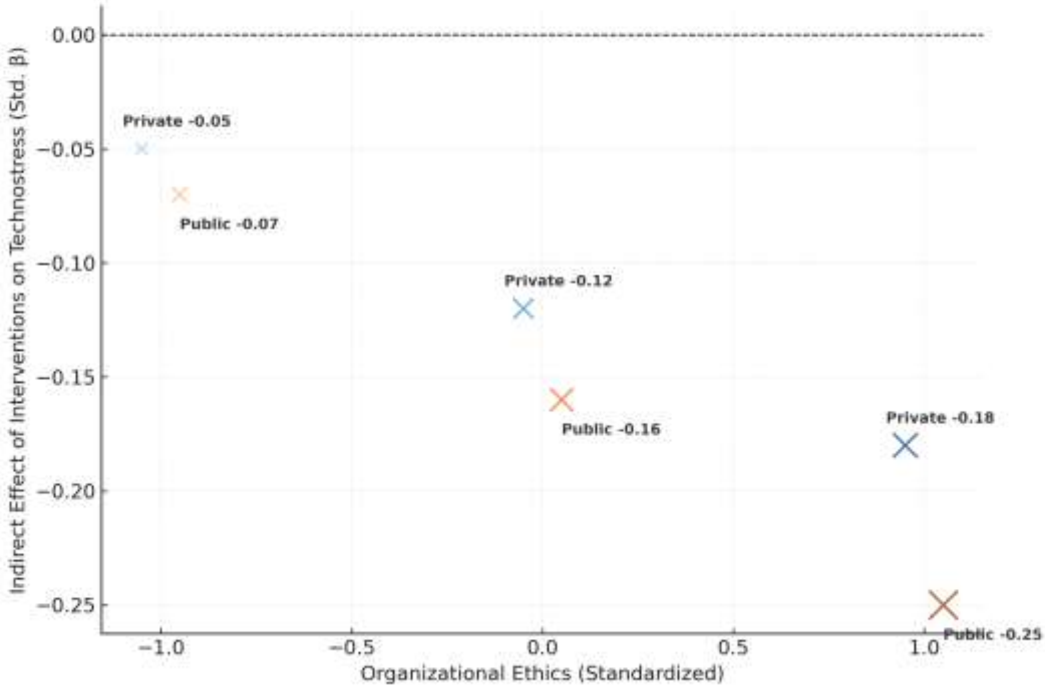

Figure 9. Indirect Effects of Technocultural Interventions on Technostress Across Ethics Levels by Sector.

Figure 9 visualizes the conditional indirect effects at varying levels of organizational ethics. Both sectors display progressively larger bubbles as ethics increase, signifying stronger indirect effects mediated through psychological safety. However, the orange gradient representing the public sector exhibits steeper growth, highlighting greater sensitivity to ethical context.

The overall model supports the TPAF structure and underscores the importance of sectoral and ethical context. Public organizations demonstrate stronger pathways between interventions, safety, and stress reduction, particularly when ethical standards are high. The latent moderated SEM reveals that while structural alignment exists across sectors, the public sector derives greater psychosocial benefit from technocultural adaptation.

DISCUSSION

The findings of this study provide compelling empirical evidence supporting the Technocultural–Psychological Adaptation Framework (TPAF), confirming that the integration of technological, cultural, and ethical dimensions offers a coherent explanation for how employees adapt psychologically to AI-augmented work systems. The results across all four objectives collectively demonstrate that technocultural interventions serve as a foundational mechanism for mitigating technostress, while psychological safety and organizational ethics operate as crucial relational and contextual forces that strengthen adaptive responses.

The validation of the five-factor model of technostress confirmed its multidimensional nature, with techno-overload, techno-uncertainty, and techno-complexity emerging as the most prominent sources of strain (Table 1). These results are consistent with the conceptualization of technostress as a composite construct shaped by multiple interrelated pressures (Kumar, 2024; Consiglio et al., 2023). The higher prevalence of techno-uncertainty and techno-overload aligns with the argument of König (2024) and Zhang et al. (2023) that algorithmic opacity and automation-driven workload acceleration are among the primary drivers of psychological discomfort in AI-intensive environments. The visualization in Figure 2 further reinforces this by showing the broader dispersion of stress levels across these two dimensions, suggesting heterogeneity in employees' coping capacities; a phenomenon also highlighted by Borle et al. (2021) in their work on digital overload.

When assessing the effects of technocultural interventions, the results indicate that participatory design, leadership communication, and continuous capability development significantly enhance psychological safety while concurrently reducing technostress. This dual pathway underscores the argument of Joseph (2024) that successful technological adaptation is both a technical and a cultural process. As illustrated in Table 2, interventions exhibited a robust positive association with psychological safety ($\beta = 0.34$, $p < .001$) and a negative association with technostress ($\beta = -0.15$, $p < .001$), demonstrating that organizational practices fostering engagement and communication directly buffer psychological strain. The density distribution in Figure 4 provides visual confirmation of this pattern, showing that organizations characterized by strong intervention mechanisms cluster in zones of higher safety and lower stress. This reinforces earlier findings by Ertiö et al. (2024) and

Audrin et al. (2024), who emphasized that leadership transparency and embedded learning practices are instrumental in mitigating the psychosocial challenges associated with digital transformation.

The cross-sectoral differences observed in Figure 5 reveal that the public sector derives comparatively greater benefit from technocultural interventions. Specifically, the reduction in technostress ($\Delta = -0.52$ SD) was steeper among public organizations, suggesting that the baseline institutional constraints and formal accountability norms in public entities make them more responsive to structured interventions. This result parallels the insights of Hofmann (2025) and Adali (2023), who posited that the presence of explicit ethical and procedural frameworks enhances employee adjustment during technological transitions, particularly in settings governed by public accountability. By contrast, private organizations (though often more agile technologically) showed smaller improvements, indicating that flexibility alone does not substitute for the stabilizing influence of ethical and participatory systems.

The moderated mediation analysis further deepens the understanding of how these processes unfold. The results presented in Table 3 and Table 4 reveal that psychological safety mediates the link between technocultural interventions and technostress, while organizational ethics significantly amplifies both the direct and indirect effects. The strengthening of the intervention-to-safety relationship under higher ethical conditions ($\beta = 0.12$, $p = .003$) mirrors findings by Cheong (2024) and Papagiannidis (2025), who demonstrated that fairness and transparency in technological governance enhance trust and engagement. Furthermore, the intensified protective effect of psychological safety on technostress under strong ethical climates ($\beta = -0.07$, $p = .012$) confirms the proposition by Janiukštis et al. (2024) that ethical work environments function as psychological buffers during digital change. Figure 6 and Figure 7 together visualize these relational dynamics, showing the gradient increase of the indirect effect and the growing dominance of mediated influence as ethics rises. These results empirically substantiate the moderating function of ethics theorized in Edmondson and Bransby (2023) and extend it into AI-augmented contexts, where ethical clarity appears indispensable for sustaining adaptive learning and reducing anxiety.

The full multi-group SEM estimation of the TPAF model, summarized in Table 5 and Table 6, affirms that the framework holds structurally across both sectors while revealing meaningful differences in pathway strengths. Model fit indices (CFI = 0.958; RMSEA = 0.041) confirmed the robustness of the latent structure, whereas the rejection of structural-path equality highlights that the public and private sectors follow distinct adaptation dynamics. Specifically, the path from technocultural interventions to psychological safety was stronger in public organizations ($\beta = 0.44$) compared to private ones ($\beta = 0.32$), and the link from psychological safety to technostress was correspondingly more negative ($\beta = -0.46$). These findings reinforce arguments by Parker et al. (2025) and Granato et al. (2022) that public institutions, despite bureaucratic inertia, exhibit higher responsiveness to structured and ethically grounded adaptation models because of their reliance on procedural justice and participatory accountability. The ridge density visualization in Figure 8 makes this distinction visually apparent, with public-sector distributions shifted toward stronger mediation pathways, indicating deeper integration between safety and stress reduction mechanisms.

Similarly, Figure 9 provides an indepth interpretation of how organizational ethics modifies these processes across sectors. The steeper gradient of the orange bubbles representing the public sector demonstrates that ethical context exerts a greater amplifying effect in government organizations. This result resonates with the observations of Hu et al. (2024), who found that transparency and procedural fairness in public-sector environments generate a stronger sense of legitimacy and moral confidence, which in turn reinforces psychological resilience. In contrast, the flatter trajectory of the private-sector bubbles reflects a context where ethical standards, though often formally articulated, may be unevenly implemented, reducing their capacity to amplify technocultural benefits.

These findings substantiate Joseph's (2024) proposition that sustainable digital transformation requires not only technical infrastructure but also moral and psychological infrastructures capable of supporting human well-being. By empirically confirming that ethical climate amplifies adaptive outcomes and reduces strain, this study extends socio-technical and psychological safety theories into the realm of AI-driven work systems, providing a robust and contextually grounded contribution to the understanding of digital transformation and human sustainability in organizational life.

5. CONCLUSION AND RECOMMENDATIONS

This study confirms that technocultural interventions, when supported by ethical governance and psychological safety, substantially mitigate technostress in AI-augmented work environments. The findings affirm that psychological safety mediates the relationship between interventions and stress reduction, while organizational ethics amplifies these effects, particularly in Chile's public sector where ethical accountability and participatory structures are more embedded. The Technocultural–Psychological Adaptation Framework thus provides an empirically grounded model for achieving human-centered digital transformation.

Based on these findings, the following recommendations are proposed:

1. Organizations should institutionalize technocultural interventions, by integrating participatory design, leadership communication, and continuous learning into AI adoption.
2. Managers should foster psychological safety through transparent dialogue and non-punitive feedback cultures.
3. Ethical governance bodies should establish sector-specific standards emphasizing fairness, transparency, and accountability in AI use.
4. Policymakers should promote cross-sector frameworks encouraging ethical AI oversight and psychosocial risk management to ensure sustainable digital adaptation.

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